© *Investigaciones Regionales – Journal of Regional Research, 42 (2018) – Pages 151 to 170*
Section ARTICLES

Journal of Regional Research Investigaciones Regionales

Smart sustainability: a new perspective in the sustainable tourism debate*

José Francisco Perles Ribes**, Josep Ivars Baidal**

ABSTRACT: This work tries to contribute to closing the existing gap in the relationship between sustainability and smartness, patent both in the field of research and in the management of cities and tourist destinations. The points in common between the concepts of sustainability and smartness applied to the management of tourist destinations are analyzed, as well as the critical factors that hinder its practical application, as a starting point to move towards a synergistic model for sustainable tourism destinations, called Smart Sustainability. This proposal is based on a true governance of the destination and is aimed at taking advantage of the opportunities offered by information and communication technologies (ICTs) for a more efficient and sustainable management.

JEL Classification: L83; R12; O33.

Keywords: sustainable tourism; Smart Tourism Destinations (STDs); Information and Communication Technologies (ICTs).

Sostenibilidad inteligente: una nueva perspectiva en el debate del turismo sostenible

RESUMEN: Este trabajo trata de contribuir a cerrar la brecha existente en la relación entre sostenibilidad e inteligencia, patente tanto en el ámbito de la investigación como en el de la gestión de ciudades y destinos turísticos. Se analizan los puntos en común entre los conceptos de sostenibilidad e inteligencia aplicados a la gestión de los destinos turísticos, así como los factores críticos que dificultan su aplicación práctica, como punto de partida para avanzar hacia un modelo sinérgico para los destinos turísticos sostenibles e inteligentes, denominado *Smart*

* This research has been carried out within the framework of the research Project: Analysis of planning processes applied to smart cities and tourist destinations. Balance and proposal of a new methodology: Smart Tourism Planning (CSO2017-82592-R) under the Spanish National R&D&I Plan financed by the Ministry of Economy and Competitiveness (2018-2020). The authors wish to thank the journal's referees for their insightful comments, which have improved the presentation of research substantially.

** University Institute of Tourism Research - University of Alicante.
Corresponding author: *jose.perles@ua.es* or *jfperles@gmail.com.*

Received: 15 june 2018 / Accepted: 08 october 2018.

Sustainability. Esta propuesta está basada en una verdadera gobernanza del destino y está orientada a aprovechar las oportunidades que ofrecen las tecnologías de la información y la comunicación (ICTs) para una gestión más eficiente y sostenible.

Clasificación JEL: L83; R12; O33.

Palabras clave: turismo sostenible; destinos turísticos inteligentes; tecnologías de la información y la comunicación.

1. Introduction

The debate surrounding sustainable tourism development, which became particularly intense after the Earth Summit of Rio de Janeiro (1992), has been largely rhetorical and has generated very few practical results (Garrod and Fyall, 1998; Vera, 2001; Robinson, 2004; Lansing and De Vries, 2007). The approaches taken by the research on sustainable tourism in its four dimensions (environmental, economic, social and cultural) are diverse, as are the scales of analysis. In any case, the imbalances generated by tourism development persist or have become worse. On a global scale, the expansion of tourism demand, which will reach 1.8 billion tourists in 2030 in terms of international movements, in addition to the domestic movements (between 10 and 12 billion trips) (UNWTO, 2017) is generating a considerable ecological footprint. Lenzen *et al.* (2018) find that, between 2009 and 2013, the global carbon footprint of tourism increased from 3.9 to 4.5 GtCO2e, four times more than previously estimated, accounting for about 8% of global greenhouse gas emissions. This figure must be contextualized within the real threat of climate change.

On a local level, irrespective of the different types of tourism spaces, the conventional planning schemes and supposedly alternative approaches have not ensured sustainability in development (Moscardo, 2012). This raises serious doubts about the renewal of processes that are generating major problems, such as overtourism (Postma and Schmücker, 2017), and calls for further-reaching solutions, including degrowth (Hall, 2014).

We can find a parallel of this approach focused on tourism in the growth of the world's population and its increasing concentration in urban environments, where 66% of the planet's inhabitants will live in 2050. This context poses new challenges for urban management, which are largely addressed from the smart city perspective, which is a clear predecessor of the smart tourism destination (STD). Generally speaking, the smart city concept encompasses the improvement of sustainability through greater efficiency obtained from the use of new technologies and a higher volume of information for management (Giffinger *et al.,* 2007; Komninos, 2015), generally within the new governance processes (Caragliu, Del Bo and Nijkamp, 2011). Similarly, sustainability constitutes an inseparable part of the smart tourist destination concept, at least from a theoretical point of view.

This article reviews the concepts of sustainability and smartness applied to tourist destinations. The objective is to identify common and complementary aspects so

as to explore the possibility of obtaining higher levels of sustainability based on the development of a smart tourist destination strategy along the lines put forward by Perles and Ramón (2017). The study is structured into three sections: an assessment of the real effect of applying the paradigm of sustainability to tourist destinations; an evaluation of the smart destination approach as a reference for re-thinking the sustainability of destinations; and an attempt to formulate a synergistic model for sustainable and smart destinations called smart sustainability. In this way, we seek to explore the relationship between the concepts of sustainability and smartness within tourism in greater depth. Ahvenniemi *et al.* (2018) point out that, in the case of smart cities, there is a large gap in this relationship which must be resolved so that progress can be made in the application of the sustainable and smart development approaches. Finally, in the debate about the sustainability of tourism, most studies have focused on theorising and policy formulation, while the benefits of technology for sustainable tourism have been researched less (Ali and Frew, 2013). This justifies the use of a new analytical perspective related to technology and its smart use in order to explore which new features have emerged in the long debate on tourism sustainability.

2. Do sustainable tourism destinations exist?

The concept of sustainable development, rooted in the environmental awareness of the 1970s, is associated to the impossibility of reaching unlimited growth in a world of limited resources. Defined by Brundtland (1987) as the «development that meets the needs of the present without compromising the ability of future generations to meet their own needs», it has been adapted to tourism, and sustainable tourism is understood as that which «meets the needs of present tourists and host regions while protecting and enhancing opportunity for the future. It is envisaged as leading to management of all resources in such a way that economic, social, and aesthetic needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity, and life support systems» (UNWTO, 1993). However, there is no generally accepted definition of sustainable tourism. In view of this lack of precision, the concept has often been relegated to a mere rhetorical use (Hughes, Weaver and Pforr, 2015; Gössling, Hall and Weaver, 2009). The breadth, complexity and evolution of the concept make it difficult to understand or hinder its practical management and cause possible confusion with other concepts such as resilience (Farrell and Twining-Ward, 2005; Lew, Ng, Ni and Wu, 2016).

Nevertheless, there is a basic series of generally accepted principles or objectives related to the sustainability of destinations based on the four dimensions of the concept, namely the environmental, social, cultural and economic dimensions (McKercher, 2003). Wight (2002) highlights the intrinsic value of the environment and the need for its long-term viability not to be compromised by a short-term view; tourism should be recognised as a positive activity which can benefit the community, the destinations and the visitors; the relationships between tourism and the environment should be managed in a way so that the former does not harm the lat-

ter, impair its future enjoyment or generate unacceptable impacts; tourism development should respect the size, nature and characteristics of the destination; it should establish a harmonious balance between the needs of the visitor, the place and the resident community; all of the agents involved should respect these principles —the tourism industry, governments, environmental agencies— and work together to achieve them.

The World Tourism Organisation has extended these principles to incorporate the guarantee of economic viability of destinations in the long term; the fostering of local prosperity, social equity and the generation of quality employment; a satisfactory experience for visitors without gender, racial or disability discrimination; the control and local planning of tourism processes; the maintenance of local well-being levels and the promotion of cultural wealth; the preservation of the physical integrity of landscapes and resources and the biological diversity; and the achievement of maximum efficiency in resource consumption and the minimisation of the impact of the tourism activity on the environment (UNWTO, 2013).

These principals are fulfilled through the implementation of measures structured around five basic pillars, namely: the governance and design of the tourism policy; economic performance and competitiveness; employment and human capital; a reduction in poverty; and the fostering of social inclusion and the natural and cultural sustainability of tourism development (UNWTO, 2013). Within this context, key roles are played by integrated planning (Wight, 2002); innovation —understood as responsible innovation—, proactive research and education (Hjalager, 1997; Wight, 2002; Blauwhof, 2012); the active involvement of residents and stakeholders in the whole process through cooperation and the creation of partnerships (Simpson, 2001; Wight, 2002) and a real long-term perspective which should avoid the simple linear cause-effect relationships and adopt new methods for resolving problems (Fodness, 2016). In parallel with the development of these general principles, initiatives aimed at measuring the sustainability of destinations have proliferated. Currently, there are many proposals of indicators (UNWTO, 2004; EC, 2016) and practical measurements related to all spheres —international, national, regional and local—. However, a definition of generally accepted indicators used in practice has not been reached (Önder, Wöber and Zekan, 2017).

In the distribution of roles for the promotion of a more sustainable tourism, the public sector would be responsible for managing environmental resources; integrating tourism in the planning and management of resources; advising tour operators; promoting the participation of citizens and stakeholders in decision-making; educating and disseminating information; establishing cooperative partnerships with communities and other administrations; or promoting research (Wight, 2002). Meanwhile, the corporate sphere is required to adopt an environmental approach in business through a leadership focused on quality; to identify sustainable tourism with a possible strategic market niche for certain demand segments; to incorporate sustainability as a transversal aspect of management; to prioritise products and destinations which have a sustainable orientation; and to implement actions to render demand behaviour more

sustainable and to promote the protection of spaces or the regeneration of run-down areas of interest for industry (Kirstges, 2002).

Despite this vast theoretical development, the practical application of sustainable development, and, by extension, sustainable tourism, has been strongly debated by authors such as Smith (2010) or Blauwhof (2012) who express their scepticism about the possibility of achieving true sustainable development without growth. The few empirical studies on the subject (O'Neill, 2015) point to an overall panorama of a preference for growth and the existence of very few economies operating within the framework of a sustainable or stationary state. In tourism, although sustainability may constitute a diversification strategy which is profitable for companies (Bagur, Martí and Rocafort, 2014), we can observe that it is very difficult to transfer the concept from the academic sphere to industry (Ruhanen, 2008) and that the term has been abused by the public sector, which has incorporated it into its plans as a guiding principle. However, this contradicts with the short-term interim goals related to growth (Hall, 1994).

There are very few examples where true sustainable tourism has been achieved or even attempted (McKercher, 2003). Calvià, in the Balearic Islands, was a promising case but today it is very far removed from being a sustainable destination (Dodds, 2008). Consequently, there is an overall pessimism regarding the possibility of achieving a true sustainable development of destinations, and authors such as Lawn (2011) or Kerschner (2010) believe that today sustainable development, that is, development without growth, is not sufficient and a real degrowth would be required to ensure the future of the destinations.

Therefore, even with all the progress that has been made, essentially related to a weak type of sustainability (Vera and Ivars, 2003), today, sustainable tourism is still more of a desire than a reality, given that, beyond the many models and myriad of existing indicators, there are relatively few success stories in the application of true sustainability in tourist destinations. This is particularly true in the case of mass tourism destinations, where it is doubtlessly even more necessary (Wall, 1992; Berno and Bricker, 2001).

3. The STD approach as a reference to rethinking sustainability

The STD is a new concept on which there is currently no basic consensus (Del Chiappa and Baggio, 2015). It can be analysed from different perspectives: territorial and public management, from the point of view of private agents, etc. (Ivars, Solsona and Giner, 2016). Spain is one of the principal destinations where this approach has experienced a greater development (Gretzel *et al.,* 2015; OECD, 2018), driven by certain institutions (particularly AENOR and SEGITTUR on a national level and regional initiatives, such as the one developed by the Valencian Tourist Agency and the Valencian Institute of Tourist Technologies).

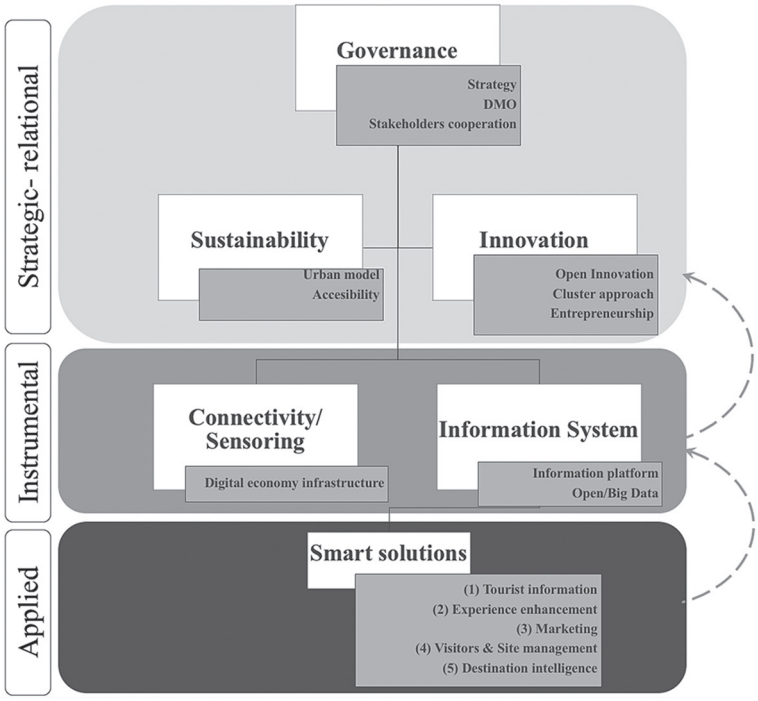
According to SEGITTUR, an STD is «an innovative tourist destination, built on an infrastructure of state-of-the-art technology guaranteeing the sustainable development of the tourist area, accessible to everyone, which facilitates the visitors' interaction with and integration into their surroundings, increases the quality of the experience at the destination, while also improving the quality of life of its residents» (SEGITTUR, 2015: 32). Essentially, the STD represents an adaptation to tourism of the Smart Cities concept (Gretzel *et al.,* 2015). Smart cities are understood as being urban spaces in which information and communication technologies (ICTs) play a fundamental role in the design of innovative urban spaces in order to facilitate their sustainability and improve the lives of their inhabitants (Buhalis and Amaranggana, 2015; SEGITTUR, 2015:24; Ivars *et al.,* 2016). STDs are different to Smart Cities due to their blurred geographical boundaries, they are oriented more towards the tourist than the resident, they have a shared governance system through mixed public-private bodies in which all of the stakeholders are represented, the scope of actions goes beyond the stay in the city (tourist motivation and loyalty), and there is a strong emphasis on competitiveness and the improvement of the experience of the visitors (SEGITTUR, 2015). Specifically, a key element of the STD is the interconnection between the different agents of the destination through a central platform or a smart headquarters which receives the inputs of different sources and transforms the data into information and services so that the institutions are able to manage the destination more efficiently and companies can offer services with added value and translate into more satisfactory experiences for the tourists (Boes, Buhalis and Inversini, 2016; Buhalis and Amaranggana, 2014).

From an operational perspective, the UNE 178501 regulation referring to the requirements of the management systems of smart tourist destinations constitutes an interesting reference. The management system is based on four pillars: innovation, technology, universal accessibility and sustainability, which is one of the principal objectives of the STDs and incorporates the economic dimension linked to competitiveness, the social component related to the quality of life of the residents and the environmental dimension connected to the efficient management of natural resources. Although technology has a prominent role in the STDs, the existence of an STD does not mean doing the same but with technology. Rather, it involves the incorporation of new ways of managing the destination and a reinforcement of public-private cooperation (INVAT.TUR, 2015). Technology is not important *per se*, but because of the potential interactions that its use can imply with respect to traditional management. Furthermore, as a more general concept of smart territory, the STD links sustainable development with competitiveness (Vegara and Rivas, 2004; Calderero, Sainz and Ugalde, 2006). Without sustainability, a destination cannot be conceptualised as smart.

The connections between smartness and sustainability are expressed on two complementary levels: the strategy of the destination and the application of technologies for a more efficient environmental management. Without a doubt, both levels are connected to a new governance framework, a fundamental pillar for the development of an STD. Ivars *et al.* (2017) propose a systemic approach for managing an STD in

which three levels interact: the strategic-relational, the instrumental and the applied levels (Figure 1). The strategic-relational level depends on an appropriate governance which establishes a sustainable territorial-tourism model shared by the local society. This reference model provides the basis on which to develop the smart solutions adapted to the needs of the destination which are supported, from the instrumental point of view, by technology and the information system. Consequently, the development of an STD should contemplate the sustainability of the tourism model as a premise and not merely apply technologies to improve traditional processes. That is to say, the STD must assume the management of tourism growth in a sustainable way or, even more radical alternatives should be considered, such as evolving towards steady state or degrowth situations.

Figure 1. Systemic Smart Tourism Destination Model



Source: Ivars *et al.,* 2017.

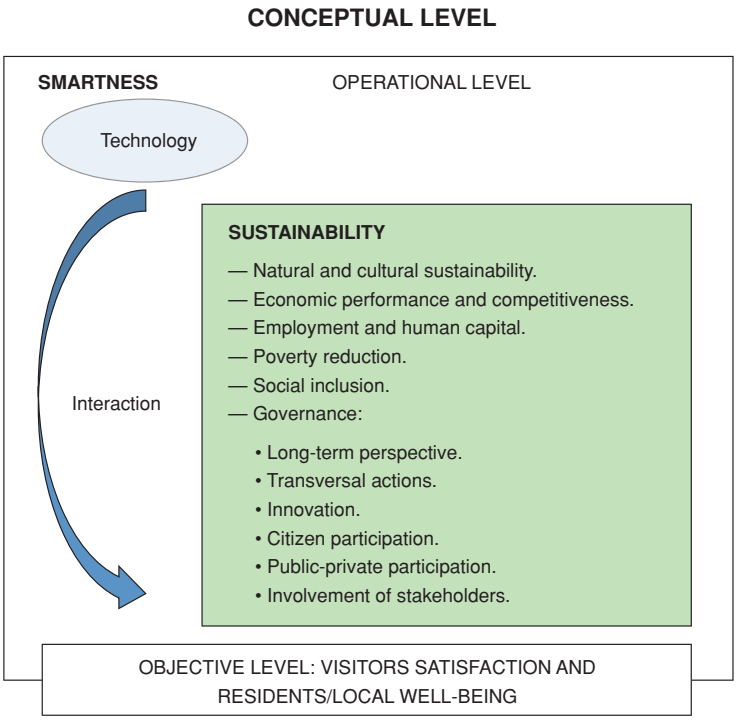
The strategic approach is fundamental, although, as pointed out by Ali and Frew (2013), we should remember that in the field of sustainable development, the policies have been oriented more towards strategy formulation than strategy implementation and that, currently, technologies constitute a fundamental support to transform theory into action. In this sense, the possibilities of technological application are enormous and truly complex given the rapid evolution that they are

experiencing. Undoubtedly, technological infrastructures (public transport networks, electrical grids, infrastructures related to the water cycle, telecommunication networks, smart buildings, etc.) constitute a basic pillar for the functioning and management of the city. However, what makes a city or a destination smart are information and communication technologies (ICTs), which enable the generation of new data sources and the integration and exploitation of information for decision making in real time, thanks to the convergence of technologies such as the Internet of things, cloud computing and big data, among others (Ontiveros, Vizcaíno and López, 2017).

The still scarce research on technology and sustainability in tourism has mainly focused on ICTs. Traditionally, most ICT developments in tourism have concentrated on marketing, distribution and profitability rather than on facilitating responsible tourism; a line of research with great potential (Benckendorf *et al.,* 2014). Ali and Frew (2013) conducted an interesting systematization of ICT-based tools/applications for sustainable tourism development. Benckendorf *et al.* (2014) focus more on the impact of ICTs on the objectives of sustainable tourism in the three of its four dimensions (environmental, economic and social) of sustainability. Gösling (2017) has also conducted an exploratory analysis of the impact on these three dimensions of tourist behaviour derived from the platforms that have notably transformed the tourism system (different types of platform: online reservations —Booking, Hotels, etc.—; sharing and peer-to-peer marketplaces —AirBnB, Uber, etc.—; online travel agents —Expedia, Orbitz, etc.—; evaluation, opinion and advice —Tripadvisor, Zoover, etc.—; and travel identity —Facebook, Instagram, etc.—). Within the framework of these new lines of research, this study seeks to contribute to the analysis of the relationships between ICTs and sustainability from the perspective of the current paradigm of smart destinations.

The concepts of sustainability and smartness share many common elements (Figure 2). On a conceptual level, the former is implicit in the latter. That is, a destination cannot be considered as being smart if it is not sustainable. Figure 2 illustrates this fact by including the set that makes up sustainability within the larger set called smartness. Within the set of sustainability, its pillars are framed, highlighting in the governance pillar, the subset of elements shared with the concept of smart tourism destination. On an operational level, a new governance framework predominated by long-term planning; the transversal nature of the necessary actions that go beyond the tourism-related institutions or departments; innovation and citizen participation; public-private collaboration and the involvement of all of the stakeholders are traditional elements —in the sense that they have been widely debated and accepted in the existing literature— shared by both concepts, as well as other desirable approaches, such as the achievement of competitiveness —also subsumed in smartness— of the destinations. Therefore, it should be acknowledged that the term STD is highly ambitious, given that it could be argued that if it has still not been possible to achieve the sought-after sustainability —which constitutes a part of the STD— it is hard to imagine reaching a broader whole —smartness— in which sustainability is simply one element (Perles and Ramón, 2017).

Figure 2. Shared elements between sustainability and Smart Tourism Destinations



Source: own elaboration.

The relationship between sustainability and smartness has been analysed within the framework of the smart city. It has been found that there is a need for greater conceptual precision and we can clearly rule out that smartness directly presupposes the sustainability of a specific geographical space. Different authors have analysed the role of sustainability in the strategies of smart cities from different perspectives and have concluded that it is insufficiently developed and should be better integrated into the smart city projects (Ahvenniemi *et al.,* 2017; Bibri and Krogstie, 2017; Haarstad, 2017). Ahvenniemi *et al.* (2017) even recommend the use of «smart sustainable cities» as a more accurate term and its use is growing both in the field of cities and tourist destinations in order to emphasise the dimension of the sustainability.

Without a doubt, in this complex interrelationship, the differential feature is derived from the intensive use of technology in the smart cities and destinations. The potential benefits that this use could have for the recipe based on traditional

ingredients (public-private cooperation, involvement of stakeholders, etc.) are, today, unknown. In Figure 2 these potential benefits are highlighted with the arrow named *interaction*. Within this context, the opportunities created by elements such as sensorization or big data with the monitoring and measurement of all types of tourist behaviours and subsystems of the destination —management of water, waste, urban mobility, etc.— can contribute to determining the true costs and benefits of each tourism development model. This enables their profitability to be established and provides better information for the decisions adopted by policy makers and, in short, makes the term operational so that, unlike the case of sustainability, it is not used merely in a rhetorical sense (Perles and Ramón, 2017).

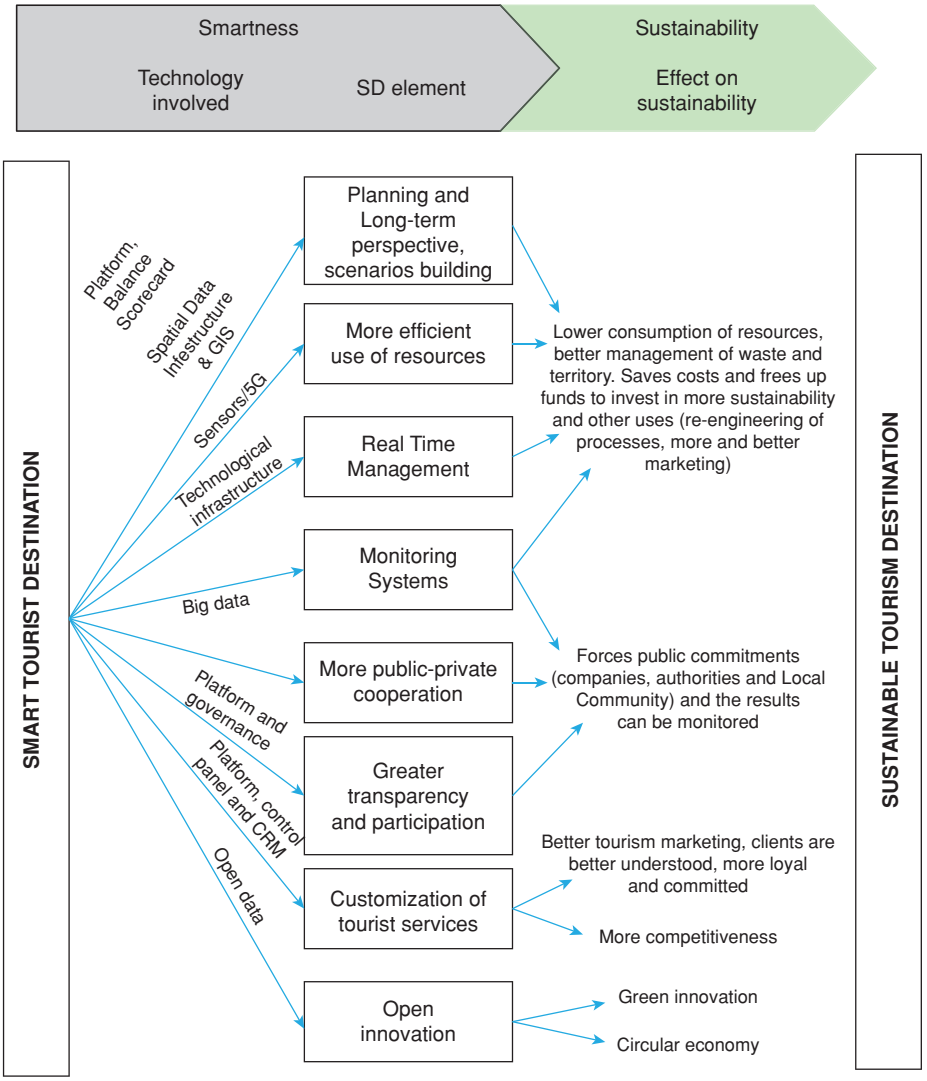
In order to avoid this possibility, below we will describe a conceptual model that seeks to describe the aspects that connect the two concepts and establish the possible transmission mechanisms which, at least from a theoretical point of view, may be more relevant in this context. All of this has the objective of directing the potential future research efforts in this field and improving the management of the destinations from a comprehensive perspective.

4. Towards a synergetic model for smart and sustainable destinations: smart sustainability

From the smart cities approach, there are still many gaps in the research on smart sustainable cities which require integrated models that incorporate both smartness and sustainability (Bibri and Krogstie, 2017). These gaps are still more evident in the field of tourist destinations because the evolution of destinations towards sustainability had still not been resolved before the paradigm of the smart destinations arose and the integration of the two perspectives is not clear and favours, again, rhetorical approaches and few practical results. In order to integrate the two perspectives, a synergetic model between smartness and sustainability is proposed (see Figure 3).

Figure 3, which is one of the main results of this paper, reflects the principal mechanisms that connect smartness with tourism sustainability through the corresponding technology in a model which has the main advantage of being measurable which can therefore allow us to support the decision-making process and communication with the different stakeholders. In the next subsections, we will detail these mechanisms, in the order of appearance in the Figure 3 (SD element boxes), identifying the fundamental aspects of smartness and sustainability which benefit from this synergetic approach. It should be noted that some closely related elements, such as monitoring systems and real-time management or public-private cooperation and open innovation, are included in a single section.

Figure 3. Theoretical channels of transmitting smartness to sustainability



4.1. Planning and a long-term perspective, scenarios building

Planning as a basic function of tourism policy and management forms part of the governance framework and, therefore, is favoured by other fundamental aspects. In particular, those relating to the improvement of the information, participation and collaboration among stakeholders and the monitoring of the planning process variables. Therefore, a new scenario emerges for tourism planning thanks to the instru-

mental contribution of technology, which should not be confused with a type of technocratic and supposedly neutral planning which shies away from the large challenges of planning from a sustainability point of view, such as the territorial-tourism model and the limits to growth.

Among the ICT applications for planning, we can highlight computer simulations, which help to visualise future scenarios and to develop forecasting techniques, or Geographical Information Systems (GIS), that can capture, store, analyse and display large amounts of geographical data (Ali and Frew, 2013). There are also computerised systems of indicators that enable us to monitor and control planning, an aspect which is generally neglected in tourism and territorial plans.

4.2. More efficient use of resources

Within the context of smart cities, obtaining higher levels of efficiency (reduction in consumption and waste, cost saving, etc.) is achieved through the interconnection of sensors and technological infrastructures with a central information platform, the Smart City Operating System (SCOS), «the platform of platforms» that integrates different data sources (sensors, social networks, etc.) and enables the simultaneous use by different users (Government, businesses, professionals, etc.) (Ontiveros *et al.,* 2017). Obviously, the SCOS contribute to improving urban and tourism management in the cities but they are only found in cities with a certain urban range, usually medium-sized and large cities. Furthermore, the more developed SCOS with a higher degree of administrative coordination provide a comprehensive vision of the city and the possibility of managing it in real time.

Similarly, the application of technology to tourism destination management has given rise to the creation of Destination Management Systems (DMS) that consolidate and distribute a comprehensive range of tourism products through a variety of channels and platforms (Ali and Frew, 2013). However, these systems are not widespread and their functions are unequal. In the case where the DMS include data on environmentally sensitive tourism resources and allow their management (reservations, access control, etc.) they would be a good tool for improving the sustainability of the destination (Buhalis, 2003; Benckendorf *et al.,* 2014). Therefore, the DMS and their integration into the SCOS still form part of a series of potentialities pending development.

With these improvements we can expect an equal or greater volume of tourists, but with a less intensive consumption of resources and a lower generation of impacts; in short, a greater environmental sustainability of the destination. The cost saving derived from this better management will enable more resources to be allocated to investing in improving the sustainability of the destination —wastewater treatment plants, conservation of resources and natural parks, etc.—. It will also lead to improving knowledge about the needs of the tourist and a better promotion and service provision to the visitor which should result in the increased competitiveness of the destination and its economic sustainability.

4.3. Monitoring system and real time management

The possibilities offered by technology for monitoring environmental and tourism parameters constitute an interesting opportunity to improve the systems of sustainability indicators and guarantee their continuous application and a real time management.

Many indicators systems have been proposed in the field of tourism, although the number of systems which are actually applied is lower due to technical and conceptual difficulties (Torres and Saarinen, 2014). Within this context, the use of ICTs would facilitate the collection of data, their processing and analysis, as well as clearly contributing to their diffusion and the development of benchmarking techniques (Choi and Sirakaya, 2006). On a destination level, it is recommended to link the indicators with the DMS and, where applicable, with the SCOS, which contribute the added value of interrelating data from different layers of geo-referenced information which, in many cases, is measurable in real time. The general system of the destination would be complemented with the environmental management information systems of the larger local companies and a more sophisticated environmental management, generally linked to certifications of environmental management.

Monitoring generates an enormous volume of data with two fundamental results: the possibility of applying Big Data techniques and the opening of the information in the form of Open Data, as a formula of transparency and of fostering innovation in the infomediary sector. Big Data encompasses both data generated from the sensorisation of the destination and new data sources with relevant information for management from the point of view of sustainability, such as, the space-time concentration of tourists in cities obtained through the analysis of the information of the online booking services (Batista *et al.,* 2018) or of the social networks in a complementary manner (Salas-Olmedo *et al.,* 2018). On the other hand, the information relating to the sustainable development of the destination should be a priority when opening data, an excessively slow process with very few noteworthy results in the field of tourism, as pointed out by Celdrán-Bernabeu, Mazón and Giner (2018) in their analysis on open data in tourism in the Spanish Network of Smart Cities.

4.4. Public-private cooperation and open innovation

Transparency and the sharing of information inherent to the concept of smart tourism destination constitute stimuli for cooperation, the transfer of knowledge and innovation in destinations. The efforts required to reach true sustainability cannot be undertaken by any agent acting alone. The extent to which the commitments adopted by companies and authorities may require shared efforts in order to be carried out and these commitments should be transparent for all of the stakeholders —this is the truly innovative aspect of the STDs in this field—. Participation and public-private cooperation are fostered to create a new form of governance, favouring an open innovation framework in the destinations.

In this way a management based on knowledge is favoured. As indicated by Ruhanen (2008), there is a gap in the transfer of knowledge to the tourism sector in practice which could be resolved through the application of ICTs. In the study conducted by Ali and Frew (2014) on the role of ICTs in sustainable development, the majority of the destination management organizations strongly agreed or agreed that the use of ICTs is an innovative approach to sustainable tourism. Hjalager (1997) referred to the importance of ICTs in classical process innovations through the improvement of productivity, and most of all, in process innovations in information handling where they are transformed into a management tool to improve efficiency, without forgetting their contribution to image promotion and communication with the customer. On a destination level, all of this information will help the stakeholders better understand their responsibility in the sustainable tourism process and make them more aware of appropriate and ethical behaviours (Ali and Frew, 2014).

The predominance of small and medium enterprises (SME) in tourism destinations implies limits that can be overcome through the use of ICTs. Benckendorf *et al.* (2014) indicate that ICTs contribute to building different types of capital for SMEs (financial, human, natural, social and physical), favouring the inter-business relationships and their business to business (B2B) and business to customer (B2C) activities, a relational environment facilitated by ICTs which would reach their peak in a smart destination, as highlighted by Del Chiappa and Baggio (2015) when considering the STD as a networked system of stakeholders delivering services to tourists, complemented by a technological infrastructure aimed at creating a digital environment which supports cooperation, knowledge sharing and open innovation.

In addition to the transversal innovation arising in the STD, there is a line of research in favour of green innovation. The basic arguments of this type of innovation are based on the efficiency in management, the protection of the biodiversity and creating the conditions for growth and sustainable development in local communities, that is, favouring green growth (OECD, 2013), a similar approach to sustainable development and equally criticised from the point of view of its real results (Hall, 2014).

4.5. Greater transparency and participation

Transparency and citizen participation are key elements of sustainable and smart tourism destinations. The functioning of the indicators system in smart tourism destinations would improve transparency and social participation in the management and participation processes. In this sense, a crucial ally of the increasing monitoring and diffusion of information is citizen participation on two complementary levels: participatory sensing, described as the use of sensors technologies to gather and share data in order to collectively monitor the urban environment, and the qualitative leap in participatory planning through the development of the e-involvement stakeholder (Presenza *et al.,* 2014).

4.6. Customization of tourist services

The increased generation of information appropriate to the STD also favours the user perspective which, in turn, becomes a new source of data generation through user generated content (UGC), an information flow which is essential for shaping the organic image of a destination and for the inter-relationships between tourists and between tourists and the agents of the destination. The tourist, conceived as a prosumer, can receive more quantitative and qualitative information about the sustainability of the destination and make decisions regarding the choice and purchase of tourism services. Furthermore, the tourism awareness actions of the destinations are enhanced, favouring a more responsible behaviour in the destination, which is complemented with community engagement actions based on sustainable development.

The degree of environmental awareness of the demand and its relationship with the attitudes and behaviour of the demand in the destination has been studied in depth. The findings reveal a gap between the attitudes declared, generally ones of responsibility towards the environment and a behaviour which is less aware and responsible (Swarbrooke, 2011). Within this context, there is no doubt that the ICTs can contribute to raising awareness and improving the behaviour in the destination. In fact, there are many initiatives related to the calculation of the ecological footprint (Gossling, 2011) or carbon calculators (Ali and Frew, 2013). Although their use is far from massive, it is growing and we can observe a link between these tools and the destinations, which should go beyond their promotional use, or greenwashing, as defined by Ali and Frew (2014) and convert them into an effective management and communication tool, taking into account that they integrate the whole trip cycle, including transport and, therefore, provide an overall perspective of the impact of the tourism activity which may be harmful to certain destinations such as long haul destinations.

Finally, smart solutions contribute to improving the tourist experience, thanks to a greater availability of information in real time which tourists can access whenever they need to (contextual marketing or location based services), even in a personalised way. For example, the management of visitors to tourist attractions through the use of ICTs contributes to the preservation of the resources (setting of visitor thresholds, diversion of flows to protect sensitive areas, interpretation, etc.) and also improves the satisfaction with the tourist experience (use of virtual or augmented reality techniques, for example).

As well as favouring the adoption of improvements in environmental resource efficiency, the new technology tools can also increase the efficiency of the promotional efforts, detecting and monitoring the new needs of the demand and orienting promotion towards more profitable and committed segments. In this way, we can expect an increase in the satisfaction with the tourist experience of the visitors and a greater loyalty among them which translates into an improved economic, cultural and social sustainability of the destination.

5. Conclusions

The sustainability of tourism destinations has proved to be a complex task, with little practical progress or even setbacks as we are being attending to the gradual expansion of tourism activity at a global level. Recently, the irruption of the smart city and the smart tourist destination has opened new hopes to achieve the desired sustainability of tourist areas. This article analyses the sustainability and smartness of tourist destinations. An exhaustive review of the literature has revealed the existence of a strong connection between the two concepts, both, from a theoretical viewpoint and on an operational level. In fact, sustainability and smartness share many common elements. Long-term vision and planning, innovation, public-private cooperation and the involvement of the stakeholders are traditional elements which form part of both concepts, shared with other paradigms, such as competitiveness.

The revision of the existing literature has allowed the authors to develop a proposal of a theoretical model that links both concepts. The proposed model facilitates the understanding of the causal mechanisms which link smartness and sustainability, which would induce the development of new lines of research on a theoretical and applied level. The analysis carried out exploits the synergies between the two paradigms and creates a synergetic model focused on smart sustainability, based on a governance framework that applies technology to five fundamental pillars: planning, the efficient management of resources; monitoring, transparency and participation, public-private cooperation, knowledge, innovation; and communication, awareness raising and the improvement of the tourist experience. In the proposed mechanisms, technology intensive use done by smart tourism destinations would play a key role through the potential interactions that may arise between the technologies and the basic elements of sustainability —planning and long-term perspective, scenarios, building, more efficient use of resources, monitoring systems and real time management, public-private cooperation and open innovation, greater transparency and participation and customization of tourist services—, which could accelerate the process of achieving it. In this sense, the relationship between smartness and sustainability cannot be conceived linearly.

In the proposed model theoretical relationships are suggested. Future empirical research should validate the causal relationships implicit in these mechanisms. Although, in theory, smartness inevitably entails the sustainability of the destination, in practice, it has been observed that this relationship is still ambiguous and, more importantly, does not guarantee effective progress towards sustainability. Thus, future research should be also focused on the practical side so as to avoid a situation where, as in the case of sustainability, the concept of smart destination is limited to a merely rhetorical use, frustrating the hopes that smartness has opened up in the generation of a new approach to tourism management.

Apart from the academic debate —theoretical or empirical— from a practical point of view, the smart application of technologies gives rise to new possibilities

for sustainable tourism development. However, preventive measures should be taken with respect to the limitations detected in the management of smart cities and destinations, including the existence of experimental projects which cannot be generalised yet; the cost-profit ratio of the investments; the frequency of top-down solutions which do not adapt to the needs of the destinations; or the environmental impact of the new technologies.

Finally, it is necessary to reflect on the objectives of tourism development. The smart destination approach may favour incremental innovation under the scope of concepts such as green innovation or green growth, but the big decisions about territorial and tourism models should derive from governance processes and not the mere application of technology, the so-called technological solutionism, which can be more of an obstacle than a useful tool for achieving true sustainable tourism development if it is used to legitimise growth processes which confer the capacity to resolve environmental and socio-economic problems to technology which it does not have. On the contrary, the concept of smart sustainability proposed in this study is oriented more towards paradigms of strong sustainability which impose limits to growth and implement the principles of the circular economy as opposed to the linear growth approaches, which are becoming completely obsolete given the growing pressure on natural resources and the threat of climate change.

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